Claims

[c1] 1. A rotor in an electrical machine, the rotor comprising:
a magnetic core having at least two poles;
a plurality of winding assemblies, one for each pole; and
a damper winding enclosing at least a portion of the magnetic core and the winding assemblies, the damper winding having (i) a plurality of electrically conductive rings concentric with a rotational axis of the magnetic core and (ii) a plurality of bars extending parallel to the rotational axis of the magnetic core and connecting to each of the rings, a radially outward surface of each of the bars being connected to a respective radially inner surface of each of the rings.

[c2] 2. A rotor as in claim 1, wherein at least one of the bars includes a plurality of projection tabs extending radially beyond the inner surface of the rings into gaps formed between successive rings.

[c3] 3. A rotor as in claim 1 wherein the plurality of rings comprise at least three rings.

[c4] 4. A rotor as in claim 1 wherein the magnetic core includes a spindle having first and second flat surfaces ex-

tending perpendicular to a direct axis of the magnetic core.

[c5] 5. A rotor as in claim 1 wherein the magnetic core includes first and second parallel faces extending substantially perpendicular to a quadrature axis of the magnetic core, a first projection connected to the first parallel face and extending beyond the first parallel face in a direction along the quadrature axis, and a second projection connected to the second parallel face and extending beyond the second parallel face in a direction along the quadrature axis but opposite to the direction in which the first projection extends.

[c6] 6. A rotor as in claim 5 wherein the first and second projections are integrally connected to the first and second parallel faces, respectively.

[c7] 7. A rotor as in claim 5 wherein the first and second projections each has a trapezoidal-shaped cross section.

[c8] 8. A rotor as in claim 5 wherein the first and second projections each has a semicircular-shaped cross section.

[c9] 9. A damper winding in a rotor having a magnetic core and a plurality of winding assemblies, the damper winding comprising:
a plurality of electrically conductive rings arranged con-

centric with a rotational axis of the magnetic core and radially outward of the magnetic core and winding assemblies; and

a plurality of bars extending parallel to the rotational axis of the magnetic core, a radially outward surface of each of the bars being connected to a respective radially inner surface of each of the rings.

[c10] 10. A damper winding as in claim 9, wherein at least one of the bars includes a plurality of projection tabs extending radially beyond the inner surface of the rings into gaps formed between successive rings.

[c11] 11. A damper winding as in claim 9 wherein the plurality of rings comprise at least three rings.

[c12] 12. A rotor in an electrical machine, the rotor comprising:

a plurality of winding assemblies; and

a magnetic core having at least two poles each of which is coupled to a respective one of the winding assemblies, the magnetic core including first and second parallel faces extending substantially perpendicular to a quadrature axis of the magnetic core, a first projection connected to the first parallel face and extending beyond the first parallel face in a direction along the quadrature axis, and a second projection connected to the second

parallel face and extending beyond the second parallel face in a direction along the quadrature axis but opposite to the direction in which the first projection extends.

[c13] 13. A rotor as in claim 12 wherein the first and second projections are integrally connected to the first and second parallel faces, respectively.

[c14] 14. A rotor as in claim 12 wherein the first and second projections each has a trapezoidal-shaped cross section.

[c15] 15. A rotor as in claim 12 wherein the first and second projections each has a semicircular-shaped cross section.

[c16] 16. A rotor as in claim 12 wherein the magnetic core further includes a spindle having first and second flat surfaces extending perpendicular to the direct axis of the magnetic core.

[c17] 17. A rotor in an electrical machine, the rotor comprising:
a plurality of winding assemblies; and
a magnetic core having at least two poles each of which is coupled to a respective one of the winding assemblies, the magnetic core including a spindle having first and second flat surfaces extending perpendicular to a direct axis of the magnetic core.

[c18] 18. A rotor as in claim 17 wherein the magnetic core further includes first and second parallel faces extending substantially perpendicular to the quadrature axis of the magnetic core, a first projection connected to the first parallel face and extending beyond the first parallel face in a direction along the quadrature axis, and a second projection connected to the second parallel face and extending beyond the second parallel face in a direction along the quadrature axis but opposite to the direction in which the first projection extends.

[c19] 19. A rotor as in claim 18 wherein the first and second projections each has a trapezoidal-shaped cross section.

[c20] 20. A rotor as in claim 18 wherein the first and second projections each has a semicircular-shaped cross section.